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ON THE NECESSITY FOR A MODIFICATION OF CERTAIN PHYSIOLOGICAL DOCTRINES REGARDING THE INTERRELATIONS OF NERVE AND MUSCLE.

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For some years past I have endeavored to bring to the notice of the profession a view of the interrelations of nerve and muscle—more especially of the vaso-motor nerves and the arterial muscles—which is entirely at variance with what is taught in our physiological text-books. I should be unable to find any excuse or apology for attempting so bold a task, were it not that the proofs which I have to advance are drawn entirely from the authentic storehouse of physiological research. While the facts to be here advanced are the results of observation by the great masters in this department of science, I hope to be able to show, conclusively, that the inferences or interpretations placed upon these facts are in some instances erroneous, and ought to be modified or reversed. In the examples now to be cited of an erroneous interpretation of authentic experiments, the idea evidently dominating the physiological mind was that a stimulus from nervous energy is necessary to induce muscular contraction. As a corollary to this idea, of course, it followed that when the motor nerve supplying a muscle was cut, or paralyzed from any cause, the muscle thus deprived of nerve influence was rendered incapable of displaying its contractile power. That such an idea was apparently justified by the behaviour of the *voluntary* muscles is undoubtedly true; but not so in regard to the non-striated or involuntary muscles

of organic life, which have been pronounced by physiologists to be paralyzed and powerless, at the very moment that the observers saw and recorded the palpable evidences of their more or less active contraction. In fact, so far from the current teaching of physiology being true, as regards the relations of motor nerves to involuntary muscles, the very reverse is true; the actual fact being that *muscles of the involuntary class, as a rule, contract, not when stimulated by their proper motor nerves, but when these nerves are cut, or are paralyzed, or dead.*

THE ŒSOPHAGEAL AND GASTRIC MUSCLES.

To come now to the facts. The statement continues to be repeated in each succeeding text-book on physiology, that section of the pneumogastric nerves (*vagi*) is followed by paralysis of the œsophagus and stomach. Now, on the theory uppermost in the minds of physiologists—referred to above—the œsophagus *ought* to be paralyzed here, and to be reduced to the condition of a mere flaccid tube. But that such is not the case, is evident from the fact that after the operation, food and drink fed to the animal, “in a few moments are suddenly rejected by a peculiar kind of regurgitation” (*a*). It needs no argument to prove that the sudden rejection of ingesta, in the manner stated, so far from being an evidence of paralysis, is really a proof of active contraction in the muscle. But it is said that sometimes the ingesta are detained in the œsophagus for a time, and, “owing to paralysis of this canal,” are not conveyed into the stomach (*b*). Dr. W. B. Carpenter, F.R.S., refers to this by stating that “if the pneumogastric be divided in the rabbit, on each side, above the œsophageal plexus but below the pharyngeal branches, and the animal be then fed, the food is delayed in the œsophagus which becomes greatly distended” (*c*). Now the pharyngeal branches supply the upper part, and the œsophageal plexus, the lower extremity of this muscular tube. Mark what follows on section of the *vagi* between these two! The upper part of the œsophagus, whose nerves are intact admits the food and drink apparently in a normal manner, while the lower part of the tube, which has been deprived of nervous influence, contracts upon itself, and so lessens the calibre of the “canal” as to arrest the further passage of

* Read before the Physiological Section of the North International Medical Congress, held in Washington, September, 1887.

(*a*) Dr. Dalton's Phys., p. 473. (*b*) *Ib*.
(*c*) Hum. Phys., 5th Amer. Ed., p. 404.